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Decomposition of Somatosensory Evoked Potentials in Rats

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Introduction

Somatosensory evoked potentials (SEP) contain several components that are, due to their low amplitude and overlap in time, difficult to distinguish and quantify. In this paper we present a methodology of component extraction and a description of the SEPs recorded from rat.

Methods

Silicon strips containing 4x4 recording electrodes were positioned on both hemispheres over the forelimb sensomotory areas. Around 500 stimulations were applied both on the left and right N. medianus and the responses on each hemisphere were averaged for each subject. The Topographic Matching Pursuit (TMP) method was used to decompose the averaged SEPs. This method is able to decompose multichannel data into spatio-temporal atoms defined by only a few parameters. Regions of the time-frequency (TF) space with high activation were identified in the averaged TF representation and chosen as possible stable SEP components. Atoms, whose temporal and frequency parameters were located inside these regions, were assigned to the respective components for each subject. This process can be seen as a kind of parametric filtering of data.

Results

In the present study five distinct components could be identified in the SEP data. The most prominent components had their main frequency of 51.6±5.33 Hz and 144±16.8 Hz by young and 50.7±3.99 Hz and 152±17.2 Hz by aged subjects. Furthermore, additional high frequency components could be found at 289±35.5 Hz, 456±21.2 Hz and 626±37.6 Hz by young subjects and 346±21.5 Hz, 458±21.5 Hz and 621±24 Hz by aged subjects. Moreover, significant differences of the amplitudes, temporal localizations and spatial distributions of the components were found between young and aged subjects.

Conclusion

The components are described by only a few parameters in the time, frequency and spatial domains, which is convenient and can be used for investigation of group differences of SEP components.